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ABSTRACT

Although recent research suggests that drug misuse involves multiple etiologies, more information is needed to aid in the development of individualized treatment regimens. Individuals with high sensation-seeking (SS) needs do not appear to respond well to traditional counseling approaches. Adolescents (N=584) aged 15 or 18 at time 1 (T1) and 18 or 21 at time 2 (T2) completed self-report questionnaires, behavioral tasks, and physiological measures. The results revealed that no reliable age effects on T1 levels of disinhibition needs were obtained. But drug use increased with age both in terms of initial age differences and age changes in the longitudinal study. Subjects reporting low SS needs initially maintained low SS needs and showed the lowest levels of use in frequency and quantity. High SS need individuals reported high levels of use at T1 and T2. The probability of getting drunk or high increased for individuals with high SS needs at either age and either time. The stability of needs over time and the level of needs at T1 accounted for the intensity of several drug taking behaviors over time. While the results demonstrated that the desire for stimulating experiences was a motivational determinant during the normal development of drug taking behaviors, the knowledge of SS needs at one point does not provide sufficient information to predict subsequent changes in SS needs or drug taking behaviors. (Data tables are included.) (TW)

A Longitudinal Study of Sensation-Seeking Needs and Drug Use

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Running Head: ADOLESCENT DRUG USE

Abstract

Prospective longitudinal data from a random sample of 584 adolescents, who were initially tested at the ages of 15 or 18, and again 3 years later, were analysed to determine the relationship between sensation-seeking needs and drug-using behaviors. Analyses of variance and covariance were used to investigate the effect of initial level of sensation-seeking needs, and the relative stability with which these needs were maintained over time, on both initial level and changes in the intensity of alcohol, marijuana and other drug use. The findings suggest that knowledge of both the intensity of sensation-seeking needs manifest at one point in time, and the extent that these needs change over time, is necessary to account for subsequent changes in many aspects of adolescents' drug taking behaviors. The implications of these results for recent suggestions about treatment regimens appropriate for problem users with high sensation-seeking needs are discussed.

The Effect of Sensation Seeking Needs on Changes in Drug Use during Adolescence

As it has become increasingly evident that drug misuse involves multiple etiologies, information relevant to devising individualized treatment regimens is much needed. Recently, a number of researchers (e.g. Ratliff & Burkhart, 1984; Segal, Huba & Singer, 1980; Zuckerman, 1979; 1983) have proposed that knowledge of a problem drug user's optimum level of stimulation (see Zuckerman, 1979, for a review of the theory) may provide therapeutically relevant information about his or her underlying motivations for drug use, and that this information may be used to help select an effective treatment regimen for clients who exhibit high sensation-seeking (SS) needs. For example, Segal, et al. (1980) interpret their data as suggesting that individuals whose motives for drug use involve high SS needs may be poor candidates for traditional counseling approaches. They advocate affecting behavior changes through substitution (i.e., providing more desirable SS-fulfilling activities or experiences as alternatives to drug use) in lieu of focusing on individual personality change. A parallel suggestion was made by Zuckerman (1983) in his discussion of SS needs as "displaceable" motives for problem drug use that might be rechanneled into more socially acceptable activities. While these ideas are potentially quite valuable to applied practitioners, they also seem premature in view of the absence of knowledge about (a) normative developmental trends in

the stability with which SS needs are maintained throughout the life span, (b) whether, and how, intra-individual changes in SS needs over time are related to changes in an individual's repertoire of drug taking behaviors, and (c) whether for individuals with consistently high SS needs, drug taking behaviors remain a means of meeting these needs. This study addresses these three basic questions with the aim of providing normative information about the natural lability of SS needs across two 3-year periods in adolescence, as well as the relation of level and change in SS needs to initial level and change in drug taking behaviors during that time.

Past research on alcohol and other drug taking behaviors has demonstrated that individuals are often motivated to use drugs by the desire to regulate internal emotional states: to seek relief from negative states such as stress or anxiety and to enhance or facilitate positive emotional states (e.g., excitement and joy) (Cahalan, Cisin & Crossley, 1969; Labouvie, 1984; Pohorecky, 1981; Segal, et al., 1980). (We use the term drug in the generic sense, to include both alcohol and illicit drugs, unless otherwise noted.) During the development of drug taking behaviors, the use of drugs to intensify positive emotional states has been found to be more pervasive than stress reduction motives for use. For example, adolescents and young adults more frequently endorse emotionally uplifting reasons for drug use than a variety of motivations including tension reduction (Labouvie, 1984; Rachal,

et al., 1980; Segal, et al., 1980). In addition, there is some evidence that college aged subjects' reported (e.g., Ratliff & Burkhart, 1984; Schwarz, Burkhart & Green, 1978) and actual (Schwarz, Burkhart & Green. 1962) levels of alcohol use are more strongly related to emotionally uplifting reasons for use, than to the mitigation of anxiety or depression.

An important dimension of the tendency to seek out or enhance positive emotional experiences is tapped by Zuckerman's (e.g., 1972; 1979) conceptual and empirical work with the trait construct of sensation seeking. This trait is defined by the need for and value placed on varied, novel and complex sensations and experiences, and the willingness to take physical and social risks for the sake of such experiences. The SS measurement scale resulted from Zuckerman's (1969) attempt to operationalize the concepts of optimum levels of arousal and stimulation in the form of a personality inventory. Two specific subscales of this inventory have been related to individual differences in many parameters of both normative and problem drug use (see Zuckerman, 1979 and Zuckerman, Buchsbaum & Murphy, 1980, for reviews). The Disinhibition (Dis) Subscale (a measure of the hedonistic pursuit of pleasure through extroverted activities) has been related to the intensity of drinking behavior in young adults (e.g. Ratliff & Burkhart, 1984; Schwarz, et al., 1978; Zuckerman, et al., 1972). In addition, the tendency to experiment with, or try, a variety of psychoactive drugs other than alcohol was best predicted (relative

to a large number of personality traits) either by the Dis scale (e.g. Segal & Singer, 1976), or by the Experience Seeking (ES) Scale (e.g. Segal, et al., 1980) in a number of studies. (The ES scale reflects the pursuit of new experiences through the mind and senses, including the desire for unusual life styles and friends.)

While the goal of therapeutic intervention is intra-individual change over time, the suggested applications of this line of research in the clinical area are based solely upon the results of the above and other studies of differences between individuals. It is not known whether the relationship observed between different individuals' SS needs and level of drug use, reflects or mirrors ontogenetic dependencies between SS motives and drug intake. That is, are increases and decreases in an individual's SS needs over time related to increases and decreases in the drug taking behaviors in which they engage?

In this study, we use prospective longitudinal data to evaluate how adolescents, classified on the basis of both initial (Test Time 1) level of SS needs, and the stability with which these needs are maintained over time (3 years), differ in initial level of, and changes in, drug taking behaviors measured at the same two points in time. This normative information seems fundamentally important to the process of developing individualized treatment strategies for young drug misusers.

Method

Subjects

The population from which this sample was drawn consisted of New Jersey households having telephones. This included 95% or more of the total number of households in the State. Randomly generated telephone numbers (therefore including unlisted numbers) were weighted by population density and used to contact and identify eligible New Jersey adolescents. Eligibility was based upon year of birth, and the absence of serious physical or mental handicap, or language difficulty. Approximately 40% of eligible adolescents are included in the sample. Higher family income and parental education are somewhat over-represented, relative to those of eligible non-participants. However, participants' median family income is comparable to that of the State of New Jersey ($24,000; U.S. Bureau of Census, 1981), and neither variable is restricted in terms of dispersion. Ten percent of the sample is non-white; this proportion is 7% below that obtaining in the New Jersey population at large (Bureau of Census, 1981). Further information on the sampling procedures used, and a comparison of the demographic characteristics of eligible participants to non-participants, and the population of New Jersey is contained in Pandina, Labouvie and White, 1984.

During 1979 and 1980, 933 adolescents were initially tested at the ages of 12, 15 and 18 (Time 1, T1). Ninety-four percent (882) of these subjects were tested three years later at the ages

of 15, 18 and 21, respectively (Time 2, T2). Because the item content of the SS Scales is not appropriate for individuals below the age of about 14 (Zuckerman, 1979), the present study includes only those subjects (N = 584) who were 15 or 18 years old at T1, and 18 or 21 years of age at T2, respectively.

General Procedure

Each subject was assigned a trained interviewer upon arrival at the laboratory. This interviewer individually administered a wide range of self-report questionnaires; behavioral tasks, and physiological measures. The testing session was self-paced and typically lasted 6 to 7 hours. All subjects were offered a light breakfast upon arrival at the laboratory and received a lunch at mid-day. The presentation order of all questionnaires and tasks was arrranged so as to mitigate boredom and fatigue effects.

Measures

Sensation-Seeking Needs. Two of the four subscales that comprise Form V of the Sensation Seeking Scale (Zuckerman, 1979) were administered at T1 and T2: Disinhition (Dis) and Experience Seeking (ES). Two items that duplicated information gathered elsewhere in the testing protocol were deleted from each of the original 10-item scales. Three of the four unused items involved alcohol and other drug use or attitudes; the fourth dealt with attitudes towards homosexuality. Because these scale scores are being related to alcohol and drug-using behaviors in this study, deletion of the former three items would seem desirable (see

Nicholls, Licht & Pearl, 1982), although Segal (1976) reported no differences in the discriminative power of the scales, with or without the drug items, in classifying individuals as belonging to different drug use groups.

Alpha coefficients of internal consistency were .64 and .66 for Dis, and .42 and .46 for ES at T1 and T2, respectively. Three-year stability coefficients were .54 for Dis and .49 for ES. The ES scale consistency estimates are lower than expected given past reports (Zuckerman, 1979) even when the reduction in the number of items is taken into account. Based upon this result and the fact that no two ES items shared even 5% common variance, it seemed unlikely that this scale was measuring any unitary dimension of sensation-seeking needs in the present sample and it was excluded from any further analysis. This unanticipated result is considered in the Discussion section.

Alcohol and other drug use The frequency of beer, wine, hard liquor and marijuana use in the past year was obtained via self-report ratings on a 10-point scale ranging from no use in the past year to using more than once per day. The quantity of each of these drugs consumed on a typical occasion of use was also rated by each subject on a 9-point response scale ranging from no use to more than six drinks of beer, wine, and hard liquor, and 15 "joints" of marijuana per occasion of use. For subjects who did not abstain from alcohol and marijuana, two additional measures of the intensity of intoxication achieved are included. The

conditional probability of getting "drunk" given a drinking occasion is the maximum value of the subject's response to the following question, asked for beer, wine and hard liquor: "Of all the times you drink...now, how often do you get HIGH or DRUNK?" Subjects responded on a 6-point scale ranging from never to always. A parallel question was asked of occasions of marijuana use.

Due to their relatively infrequent use by this sample, drugs other than alcohol and marijuana are not individually considered. Subjects' overall experience with illicit drugs is the sum (range 0-10) of the following drugs that the subjects reported ever using: marijuana, cocaine, heroin, psychedelics, inhalants, PCP, and the non-medical use of analgesics, stimulants, sedatives and tranquilizers.

Sample Drug Use Characteristics

Like Jessor and Jessor (1977) and Segal, et al. (1980), we find that the use of, and experimentation with, legal and illicit psychoactive drugs appear to be normative behaviors engaged in by the majority of adolescents in this fairly representative sample. At T1, 15% of the female subjects and 14% of the males reported that they abstained from the use of alcohol and all other drugs. These proportions dropped to 4% and 3%, respectively for females and males, by T2. Approximately 22% of the sample indicated that they used alcohol but no other drug at each testing occasion. The remainder of the subjects reported having used alcohol and at

least one other illicit drug. Males' and females' initial (T1) levels of illicit drug use and the extent to which each sexes' use changed over time were similar. In this sample, the traditional view that drug use is more prevelant among males than females is supported only in terms of males' larger average quantity and frequency of beer use at T1 (F = 40.41 and F = 24.34, respectively, $p<.0001$) and larger actual increase in frequency of beer drinking by T2 (F = 11.68, $p<.001$). Female subjects' drug use surpassed that of males' only in terms of a larger total increase in frequency of wine consumption (F = 8.02, $p<.01$). Overall, the drug use characteristics of our subjects are quite similar to those found in several recent large-scale surveys of adolescent drug use (Fishburne, Abelson & Cisin, 1982; Johnston, Bachman & O'Malley, 1982).

Analyses

As anticipated on the basis of past research (Farley & Cox, 1971; Ratliff & Burkhart, 1984), males endorsed a larger average number of disinhibition needs than did females (F = 50.76, $p<.0001$) at T1. Thus, disinhibition change scores (T2 - T1) were regressed on T1 scores for each sex separately, in order to classify subjects as belonging to one of four sensation-seeking groups. Subjects in the first two groups reported low disinhibition needs at T1 and reports of these needs alternately increased less than expected by T2 (L-IL), or increased more than expected by T2 (L-IM). Subjects in the remaining two groups were

initially (T1) high in disinhibition needs and subsequently decreased less than expected by T2 (H-DL), or decreased more than expected by T2 (H-DM). Note that regression towards the mean determines the predicted direction of change in the first two groups versus the latter two, and that individuals in groups L-IL and H-DL maintained relatively more stable levels of disinhibition needs over time (whether initially high or low) than those in groups L-IM and H-DM.

Dis group and age effects on initial (T1) levels of alcohol and other drug use, and on the actual or total changes (ΔA = T2 - T1) in use were tested via analyses of variance with unequal cell frequencies. Analyses of covariance, with level of use at T1 as the covariate, were used to investigate Dis group and age effects on residual changes (ΔR, i.e., those not predictable from T1 use levels) in drug use.

delta

Because covariance analysis assumes a constant regression relationship among comparison groups, tests for heterogeneity of slopes among the eight age/Dis groups were made for each use variable separately for each sex. No reliable differences between groups were obtained for either sex (all $p>.01$), suggesting that this assumption is valid for the present data. All analyses were performed separately for males and females based on past reports that sex may differentially mediate the relation of drug use to sensation-seeking needs (e.g. Ratliff & Burkhart, 1984; Zuckerman, 1979).

Results

As expected on the basis of previous research (e.g. Farley & Cox, 1971), no reliable age effects on T1 levels of disinhibition needs were obtained, and age was not systematically related to intra-individual change scores. Thus, our data do not support Zuckerman's original hypothesis that SS needs (at least Dis needs) tend to increase with age during the periods of adolescence studied here.

Age Differences and Age Changes in Drug Use

The effect of age on initial levels of drug use and on actual (ΔA) changes in use was always additive with Disinhibition (Dis) group effects. As can be seen in Table 1, both cross-sectional age differences at T1 and longitudinal age changes (ΔA from T1 to T2) reflect expected increases in the use of drugs

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Insert Table 1 about here

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from 15 to 18, followed by somewhat smaller gains or even some declines from 18 to 21.

Dis Group Differences in Drug Use

Differences between the four Dis groups in drug use at T1, in actual change (ΔA) in drug use from T1 to T2, and in residual change (ΔR) are presented in Tables 2 and 3, respectively, for females and males.[1] The results for the Disinhibition subscale

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Insert Tables 2 and 3 about here

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are shown at the top of each table. The validity of our operational definition of Dis groups is supported by the reliable group separations obtained.

Subjects in group L-IL, who were initially low and remained low in SS needs, exhibited the lowest levels of use in frequency and quantity at T1, as well as generally negative residual changes. In other words, the actual increases in drug use in this group tended to be decelerated, or smaller than expected given T1 levels of use. In comparison, those in Group H-DL, who maintained high stable SS need levels over time, typically exhibited high use levels at T1 and generally positive residual changes in use. That is, actual changes in drug taking behaviors were accelerated suggesting that previous high levels of use were maintained or in some instances increased.

Considering group L-IM, where an initially low level of SS needs was followed by a strong increase in these needs, actual changes in use from intermediate levels at T1 were often inflated by positive residual changes. Finally, in group H-DM, where an initially high level of Dis needs is followed by a strong decrease in needs, relatively high levels of use at T1 are followed by moderate changes. Note that often these changes were only slightly smaller than expected suggesting a leveling off in

intensity of use.

The only significant age by Dis group interaction was obtained for residual change in the quantity of marijuana males typically smoked ($F = 4.43$, $p<.0005$). A comparison of the eight cell means showed that the quantity of marijuana smoked by 15 year old males in group H-DL (mean = 1.31) increased significantly more than expected than in all other groups. This interaction suggests that the developmental timing of maintaining relatively high and stable levels SS needs may be particularly important for the onset of marijuana use in males.

With respect to sex differences, note that Dis group affected patterns of residual change in both frequency and quantity aspects of consumption in females. For males, differences in SS needs were not significantly related to changes in the frequency of alcohol use, but were reflected in larger than expected increases in the frequency of marijuana smoking and the quantity of alcohol consumed per occasion.

Table 4 shows group effects on the conditional probability of

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Insert Table 4 about here

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getting drunk or high, given an occasion of alcohol or marijuana use. Note that these analyses are based on a reduced sample of subjects who were users of alcohol ($N = 501$) or marijuana ($N = 272$) at both T1 and T2. In general, both of the groups that were

high in SS needs at T1 (H-DL and H-DM) reported drinking and smoking until intoxication equally often, and reliably more often than at least group L-IL at T1. Males and females in groups H-DM and L-IL tended to display no increase in the likelihood of becoming intoxicated when drinking or smoking marijuana over the three years. And subjects in the latter two groups exhibited negative residual change scores in contrast to those in the high stable, or initially low but increasing Dis need groups. Thus in addition to their impact on the consumatory variables, SS tendencies seem to be related to the phenomenal level of intoxication desired by the adolescent, that is, the intensity of the drug experience that he or she is likely to achieve given an occasion of alcohol or marijuana use.

Discussion

The present results generally confirm and extend the finding of previous individual difference studies that sensation-seeking needs are related to the relative intensity of a variety of drug-using behaviors engaged in by adolescents and young adults. Our cross-sectional (T1) data generalize this relationship to a younger sample of adolescents than has previously been tested, and demonstrate that the desire or need for novel and stimulating experiences is a motivational determinant of significance during the normal development of drug taking behaviors.

The results of the longitudinal analyses further suggest that the stability with which SS needs are maintained during

adolescence can importantly modify the effects of initial (T1) level of SS needs as it relates to changes in drug taking behaviors over time.[2] These findings suggest that knowledge of the intensity of SS needs at one point in time during adolescence often does not provide sufficient information to predict subsequent changes in the individual's overall repertoire of drug taking behaviors.

Before considering our specific results, it seems useful to review two aspects of our approach to the study of this problem that differ from previous investigations. The first of these has to do with the Dis group classification strategy. By definition, trait constructs are considered to reflect relatively consistent (across situations) and enduring (across time) personality characteristics. And with respect to the SS trait in particular, there do not seem to be significant age-related variations between subjects, or within subjects across time. Nevertheless, the magnitude of the 3-year stability coefficient for the Dis Subscale (total sample, $\underline{r}$ = .48) suggested that there was in fact considerable variability in the extent to which different subjects maintained the level of Dis needs manifest at T1. And given this variance, it was possible to group subjects on the basis of similarities in initial (T1) level of needs as well as the relative stability with which these needs were maintained over a 3-year period. The present results show that this distinction was useful in accounting for differences in the frequency of certain

drug-using behaviors as early as T1, as well as extent of change in a number of drug use behaviors as they develop over time.

Second, most previous studies of the relationship between SS needs and reported drinking behaviors have quantified alcohol use patterns in terms of some unitary index which combined information about quantity and frequency aspects of consumption (e.g. Ratliff & Burkhart, 1984; and see Zuckerman, 1979, for an earlier review). We conceptually and empirically distinguish between quantity versus frequency components of consumatory behaviors as they might be expected to relate to the fulfillment of SS needs. That is, increased frequency of drug use may lead to habituation to the SS-fulfilling properties of alcohol and other drug intake, while increases in the quantity or dose of drug consumed might continue to produce novel internal states over time. It was not, however, expected that frequency of use would be unilaterally independent of SS needs in this study due to the young age of the subjects, many of whom are in the initiation or experimentation stage of drug use. For example, there were significant Dis group effects on both sexes' frequency of beer and marijuana use, and females' frequency of hard liquor use, at T1. And note that for these drugs, the average frequency of use in group L-IL was, at T1, already distinquishably lower than in all other groups. These findings suggest that those subjects who would in the future maintain low SS needs as a stable personality characteristic, were at T1 already engaging in less frequent alcohol and marijuana use

than all other subjects, including those who were also low in SS needs at T1, but who would increase more than expected in these needs in the future.

Conversely, subjects in groups H-DL and H-DM, tended to report equivalent quantity and frequency of use patterns at T1. However, by T2 these two groups of subjects, on the average, exhibited quite different patterns of residual changes in drug use. Across the parameters of drug use investigated, positive mean residual change scores were typically evidenced by groups L-IM and H-DL, whereas generally negative mean change scores were consistently exhibited in groups L-IL and H-DM. (See Tables 2, 3 and 4.) That is, over time, both the maintenance of low stable levels of SS needs and decreases in previously high levels of needs seem to be associated with conservative or decelerated changes in use compared to those shown by peers in the initially low but increasing, or high stable Dis groups.

At the same time, high SS needs may be particularly critical in establishing use levels initially. That is, the naturally occuring decreases in Dis needs (group H-DM) that we observed were not accompanied by strong decreases in drug use over time. This result supports Segal, et al.'s (1980) and Zuckerman's (1983) suggestion that therapy with high SS drug abusers might be better aimed at providing behavioral substitutes for drug taking than facilitating personality change. In other words, larger than expected decreases in Dis needs seemed only to limit further

increases in several parameters of drug use over time, but not to promote strong reductions in relatively high levels of use once established.

In terms of absolute magnitude, average differences in drug use between groups were not always large and the average use rates even in group H-DL were far from excessive. Yet the consistent trends in accelerated versus decelerated increases in use as a function of level and change in SS needs seem noteworthy given that we were only able to include one of the two SS-need dimensions that past research has shown to be importantly related to intensity of drug use. Recall that the original design of this study included the use of both Dis and ES scale score information. However, the ES scale data were eliminated because, in our sample, they did not exhibit adequate psychometric properties. It is possible that the endorsement of one ES scale item no longer reflects an expression of the same tendencies and desires that it did a decade ago (i.e. the phenomonological meaning of associating with 'hippies'). Zuckerman (1984) has recently developed a new form of two SS scales (Disinhibition and Thrill and Adventure Seeking) that separates reports of past experiences from intended future experiences and incorporates an update of item content. We hope that Zuckerman and colleagues will continue this work with the Experience Seeking Scale to provide a good measure of the desire for more introverted SS experiences that may be affected by psychoactive drug use.

With respect to the questions raised at the start of this study, these data suggest that there are meaningful differences between individuals in their tendency to maintain relatively stable versus labile disinhibition needs between the ages of 15 and 18, and 18 and 21. Trends in the stability of Dis needs over time interacted with the level of needs manifest at T1 in accounting for changes in the intensity of several drug use behaviors over time. We are currently investigating whether this "stability characteristic" generalizes within a given individual to other domains of personality functioning (e.g., needs for dominance and achievement). If the same individuals tend to show characteristically stable versus labile personality needs during development, this may be an organismic variable of broad significance in the area of therapeutic interventions for drug misusers, as well as other areas of clinical concern. An important question for future research would include determining what factors might influence the maintenance of stable low or high level need states, versus changing needs states during development.

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Footnotes

[1] In Tables 2 through 4 the proportion of actual change that may be predicted on the basis of T1 use levels, ΔP, may be obtained by taking the difference between ΔA and ΔR. Also note that the significance of differences between ΔP means is equivalent to that shown for T1 means as the former are a linear transformation of the latter.

[2] Although the present findings are based on longitudinal observations, they do not warrent an unqualified causal interpretation. That is, an alternative explanation involves the possiblity that drug taking may facilitate the expression of previously latent SS needs through the release of inhibitions or some other mechanism.

Table 1

Age Differences in Substance Use Within Sex

Substance		Females Age at T 1		Males Age at T 1	
		15	18	15	18
		Frequency of Use in Past Year			
Beer	T1	1.91a	3.49b	2.42a	4.94b
	Δ_A	1.24a	(-0.36)b	1.74a	(0.30) b
Wine	T1	1.43a	2.26b	1.28a	2.37b
	Δ_A	0.89	(0.32)	(0.29)	(0.00)
Liquor	T1	1.24 a	2.72b	1.26a	2.76b
	Δ_A	1.08 a	(0.32)b	0.68	0.54
Marijuana	T1	1.30a	2.06b	1.49a	3.01 b
	Δ_A	(0.34)	(-0.16)	0.82	-0.59b
		Quantity Per Occasion of Use			
Beer	T1	1.62a	2.85	2.46a	4.58b
	Δ_A	1.94a	(0.37) b	2.66a	(0.44) b
Wine	T1	1.16a	1.96b	1.05a	2.27b
	Δ_A	1.92a	0.87b	1.72a	(0.52) b
Liquor	T1	1.11a	2.51b	1.59a	2.88b
	Δ_A	1.90a	0.95 b	1.99	1.17
Marijuana	T1	1.04	1.32	0.99a	1.85b
	Δ_A	(0.24)	(0.02)	0.67a	(-0.34) b
		Number Illicit Drugs Used			
Total	T 1	0.79 a	1.84 b	0.61a	2.32b

(Table Continued)

Table 1

		Number Illicit Drugs Used			
Total	Δ_A	0.47	0.40	0.77 a	(0.17) b
n		152	144	153	135
		Conditional Probability of Getting Drunk/High			
Alcohol	T1	1.43 a	1.93 b	1.67 a	2.62 b
	Δ_A	1.00 a	0.45 b	0.98 a	(0.14) b
Marijuana	T1	1.74	2.44	2.27	2.53
	Δ_A	1.12	0.94	0.82	0.64

Note. Means followed by different letters differ significantly ($p < .01$).

Note. Actual mean change scores that do not differ reliably from zero are in parentheses.

Table 2

Disinhibition Group Effects on Females' Drug Use

Variable		Group				
		Total	L-IL	L-IM	H-DL	H-DM
Disinhibition	T1	3.32	1.32 a	2.02 b	5.13 c	4.83 c
	Δ_A	0.05	(-0.14) a	2.69 b	(0.30)c	-2.02d
	Δ_R		-0.88 a	2.19 b	0.87c	-1.56d
		Frequency of Use in Past Year				
Beer	T1	2.67	1.67 a	2.38 a,b	3.27 b,c	3.48 c
	Δ_A	0.43	(0.26) a,b	0.89 b	0.82 b	(-0.21)a
	Δ_R		-0.67 a	0.31 b	0.69 b,c	-0.23 a,b
Wine	T1	1.84	1.39	1.83	2.15	2.02
	Δ_A	0.59	(0.60)	0.78	0.78	(0.26)
	Δ_R		-0.30	0.18	0.41	-0.20
Liquor	T1	1.97	1.22 a	1.98 b	2.14 b	2.58b
	Δ_A	0.66	0.69 a	1.05 a	1.21 a	(-0.16)b
	Δ_R		-0.45 a	0.40 b	0.66 b	-0.43 a
Marijuana	T1	1.67	0.68 a	1.58 b	2.08 b	2.40 b
	Δ_A	0.09	(0.18)	(0.48)	(-0.05)	(-0.25)
	Δ_R		-0.41	0.35	0.07	0.03
		Quantity Per Occasion of Use				
Beer	T1	2.21	1.19 a	1.92 a,b	2.82 b,c	3.02 c
	Δ_A	1.15	1.02	1.48	1.53	(0.59)
	Δ_R		-0.66 a	0.17 b	0.69 b	-0.14 a,b

(Table Continued)

Table 2

		Quantity of Occasion of Use				
Wine	T1	1.54	0.87a	1.29a,b	2.22c	1.86b,c
	Δ_A	1.41	1.49	1.83	1.18	1.08
	Δ_R		- 0.47	0.23	0.32	-0.07
Liquor	T1	1.79	0.96a	1.72a,b	2.07b	2.49b
	Δ_A	1.41	1.48	1.72	1.81	0.71
	Δ_R		-0.56a	0.25b	0.61b	-0.17a,b
Marijuana	T1	1.16	0.52a	1.03a,b	1.55b,c	1.60c
	Δ_A	0.13	(0.18)	0.44	(0.01)	(-0.12)
	Δ_R		-0.28	0.24	0.09	-0.02
		Number of Illicit Drugs Used				
Total	T1	1.29	0.64a	1.29a,b	1.57b	1.75b
	Δ_A	0.41	(0.16)	0.76	0.64	(0.18)
	Δ_R		-0.58a	0.34b	0.37b	0.00a,b
n		296[a]	76	75	61	84

Note. Means followed by different letters differ significantly ($p < .01$).

Note. Actual mean change scores that do not differ reliably from zero are in parentheses.

[a]The total n varies between 291 and 296 across analyses due to missing data.

Table 3

Disinhibition Group Effects on Males' Drug Use

Variable		Group				
		Total	L-IL	L-IM	H-DL	H-DM
Disinhibition	T1	4.51	2.20a	3.47b	6.40c	5.56d
	Δ_A	-0.01	(0.03)a	2.20b	(0.17)a	-2.17c
	Δ_R		-1.00a	1.73b	1.00c	-1.71d
		Frequency of Use in Past Year				
Beer	T1	3.65	2.78a	3.81b	4.24b	3.88b
	Δ_A	1.05	1.07	1.33	0.82	0.87
	Δ_R		-0.40	0.35	0.06	-0.07
Wine	T1	1.83	1.62	2.05	1.47	2.16
	Δ_A	0.11	(0.48)	(0.08)	(0.36)	(-0.34)
	Δ_R		0.22	0.13	-0.02	-0.20
Liquor	T1	2.00	1.55	2.01	2.18	2.31
	Δ_A	0.56	0.81	0.74	0.65	(0.26)
	Δ_R		-0.03	0.18	0.20	-0.11
Marijuana	T1	2.27	0.82a	2.21b	3.30c	2.65c
	Δ_A	0.11	(0.21)	(0.00)	(0.40)	(-0.15)
	Δ_R		-0.63a	-0.13a	0.81b	-0.07a
		Quantity per Occasion of Use				
Beer	T1	3.55	2.41a	3.52a.b	4.22b	3.94b
	Δ_A	1.62	1.44	1.71	1.57	1.47
	Δ_R		-0.85a	0.08b	0.33b	0.10b

(Table Continued)

Table 3

			Quantity Per Occasion of Use			
Wine	T1	1.69	1.31	1.86	1.53	1.94
	Δ_A	1.12	(0.87)	1.31	1.70	(0.61)
	Δ_R		-0.52a	0.30a,b	0.47b	-0.35a,b
Liquor	T1	2.22	1.43a	2.01a,b	2.99b	2.53b
	Δ_A	1.61	1.64	1.93	1.44	1.32
	Δ_R		-0.52	0.18	0.36	-0.08
Marijuana	T1	1.46	0.53a	1.56b	1.90b	1.69b
	Δ_A	0.13	(0.39)	(0.00)	(0.42)	(-0.14)
	Δ_R		-0.32a	-0.07a	0.56b	-0.12a
			Number of Illicit Drugs Used			
Total	T1	1.45	0.78a	1.40a,b	2.07b	1.61a,b
	Δ_A	0.51	(0.07)	0.59	0.72	(0.50)
	Δ_R		-0.73a	0.06b	0.49b	0.07b
n		288[a]	51	88	58	91

Note. Means followed by different letters differ significantly ($p < .01$).

Note. Actual mean change scores that do not differ reliably from zero are in parentheses.

[a]The total n varies between 284 and 288 across analysis due to missing data.

Table 4

Disinhibition Group Effects on Alcohol and Marijuana Users' Likelihood of Intoxication

			Group			
		Total	L-IL	L-IM	H-DL	H-DM
Sex						
			Alcohol			
Females	Tl	1.70	0.87a	1.33a	2.16b	2.34b
	Δ_A	0.70	0.88a	1.23a	0.59a,b	(0.21) b
	Δ_R		-0.36a	0.29b	0.18a,b	-0.08a
Males	Tl	2.22	1.69a	1.91a,b	2.46a,b	2.54b
	Δ_A	0.57	(0.39)	0.95	0.70	(0.21)
	Δ_R		-0.54a	0.17b	0.29b	-0.15a
			Marijuana			
Females	Tl	2.33	1.33a	1.71a,b	2.56b,c	2.76c
	Δ_A	0.93	(1.08) a,b	1.72 b	0.91 a,b	(0.40) a
	Δ_R		-0.50	0.38	0.13	-0.24
Males	Tl	2.64	1.77	2.70	2.59	2.54
	Δ_A	0.67	(0.77)	(0.54)	1.03	(0.59)
	Δ_R		-0.47	-0.09	0.33	-0.15

Note. Means followed by different letters differ significantly ($p < .01$).

Note. Actual mean change scores that do not differ reliably from zero are in parentheses.